SCIENTIFIC SERIALS

THE current number of the *Journal of Anatomy and Physiology*—the second under the new system—commences with a paper by Dr. G. Thier and Mr. J. C. Ewart, entitled "A Contribution to the Anatomy of the Lens." The fibres of that organ are stated to be composed of a number of flattened bands, termed primary fibres, and to be covered with elongated flat cells resting on a structureless membrane.—Dr. McIntosh describes the central nervous system, the cephalic sacs, and other points in the anatomy of the Lineidæ, demonstrating that in the Nemerteans the nervous system is highly developed, and that the cephalic sacs are special organs of sense, their internal surface being in direct communication with the surrounding water by the ciliated duct, whilst the fibrous peduncle places their cells in continuity with the central nervous system. The paper is profusely illustrated.—Prof. Rutherford, who has been assisted by M. Vignal, records his experiments on the biliary secretion of the dog. In almost every case the animal had fasted about eighteen hours. Under the influence of curare a tube was tied into the bile duct. The amount of bile which flowed in each quarter of an hour was measured. The cholagogue action of croton oil is shown to be *nil*; that of podophylline considerable; that of aloes powerful; that of rhubarb well marked; that of senna feeble; that of colchicum considerable, by making the bile watery; that of taraxacum very feeble; that of scammony feeble; that of calomel probably *nil*; that of gamboge *nil*; that of castor-oil *nil*. The memoir, with its valuable diagrams, deserves special attention.—Dr. Galabin contributes an article on the pulse-wave in the different arteries of the body. The author, we are glad to see, has modified his previous statement as to the modification of a double wave the result of a single impulse, in the explanation of the predicrotic undulation in the sphygmograph trace. He gives an explanation of this as well as of the predicrotic wave. Some of his arguments are, we think, based on too few facts, whilst others are complicated by their pathological nature.—Mr. D. J. Cunningham has some notes on the broncho-œsophageal and pleuro-œsophageal muscles of man, first described by Hyrtl. —Dr. Stirling contributes a memoir on the summation of electrical stimuli applied to the skin, in which, from an excellent series of experiments on the frog, he demonstrates, according to the view of W. Baxt, that *reflex movements can only be liberated by repeated impulses communicated to the nervous centres*.—Mr. F. M. Balfour commences a series of papers to ultimately constitute a monograph on the development of Elasmobranch Fishes. Commencing with the ripe ovarian ovum, its description is followed by that of the segmentation, in the volume before us. This monograph will be an invaluable adjunct to that on the hen's egg, by Dr. M. Foster and the same author, and is a most promising production of the Biological school of the University of Cambridge.—Prof. Huxley writes on the nature of the craniofacial apparatus of *Petromyzon*, a specially favoured region of that author. The plates are unfortunately delayed for three months.—Mr. S. M. Bradley has a note on the secondary arches of the foot.—Prof. Turner, lastly, gives a note on the placental area in the uterus of the cat after delivery, in which he shows that in delivery not all the mucosa of the placental area comes away, its deeper structures being partly left. —Prof. Turner and Mr. Cunningham's report on the progress of anatomy concludes the part.

Archives des Sciences Physiques et Naturelles, Oct. 15, 1875.—In this number is concluded an important paper by Prof. Lemström, of Helsingfors, on the theory of Aurora Borealis, *àpropos* of some phenomena of Geissler tubes. The phenomenon from which he set out was that a Geissler tube is illuminated when near the pole of an electric machine, without the tube touching the poles. Air, at a pressure of 5 to 10 mm., acquires its maximum electric conductivity, and Prof. Lemström conceives the air in the upper regions of the atmosphere, rarefied to about 5 mm., as forming a great conductor concentric with the earth; its height some 3,000 kilometres less at the poles than at the equator, and the electric density (on both conductors) 9 per cent. greater, while the force with which the electricity of the atmospheric conductor is attracted to the earth is 42 per cent. greater (at poles than at equator). Thus there is accumulation of atmospheric electricity at the poles, and the auroras are produced on its combination with that of the earth. The theory regards aurora as a phenomenon entirely of our globe; but the possibility is not excluded of an action of the sun, causing a periodical variation of auroras, through meteorological phenomena, such as evaporation on the earth's surface.—Prof. Schnetzler contributes some observations on Bacteria.—M. Cellerier investigates mathematically the simultaneous movement of a pendulum and its supports; and a *résumé* is given of the proceedings at the extraordinary session of the Geological Society of France, held in the end of August at Geneva and Chamounix.—In the "Bulletin Scientifique" there is a description of a curious phenomenon observed by M. Gumœlius in Sweden, viz., intercrossing rainbows.

Journal de Physique, November, 1875.—This number contains the second part of M. de Romilly's paper on the conveyance of air by a jet of air or of vapour. He investigates the effects of the jet when driven against the lateral wall of the receiver, the orifices of the discharge-pipe and the receiver forming, if projected on a plane parallel to them, two circles exteriorly tangent. The form and separation of the two instruments are varied.—M. Angot, in another continued paper, gives a good account of Thomson's quadrant electrometer.—There are also short mathematical notes on the verification of the law of Huyghens, by M. Abrin; and elementary demonstration of the formula of La Place, by M. Lippmann, together with the usual amount of matter abstracted from other serials.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Jan. 6.—On the Expansion of Sea-water by Heat. By T. E. Thorpe, Ph.D., and A. W. Rucker, M.A. (Fellow of Brasenose College, Oxford), Professors of Chemistry and Physics in the Yorkshire College of Science.

The extensive contributions which have recently been made to the physical history of the ocean have shown the desirability of exact knowledge of the relations of sea-water to heat. The authors have accordingly made observations in order to determine the law of the thermal expansion of sea-water.

The only attempt hitherto made to solve this problem which can lay any real claim to consideration is due to the late Prof. Hubbard, of the United States National Observatory. The results of his investigation are contained in Maury's "Sailing Directions," 1858, vol. i. p. 237.

Muncke, nearly fifty years ago, determined the expansion of an artificial sea-water at various temperatures between 0° and 100° C.; but our confidence in the results as applicable to natural sea-water is affected by the circumstance that the solution was prepared from data furnished by the imperfect analyses of Vogel and Bouillon La-Grange.

The observations of Despretz were confined to temperatures below 13°·27, as the main object of his inquiry was the determination of the point of maximum density of sea-water. The subsequent investigations of Neumann and Rossetti were equally limited, as they were undertaken with the same view.

The water used in the authors' observations was collected from the Atlantic, in lat. 50° 48′ N. and long. 31° 14′ W.; and its specific gravity at 0° C., compared with distilled water at the same temperature, was found by the bottle to be 1·02867.

The method of experiment was precisely the same as that already employed by one of the authors in determining the expansion of the liquid chlorides of phosphorus. It was essentially that already used by Kopp and Pierre; *i.e.* the expansion was observed in thermometer-shaped vessels (so-called dilatometers), graduated and accurately calibrated.

Three of these instruments and two sets of thermometers were employed. The latter were made by Casella; the length of a degree in different instruments varied between 9 and 13 millims.; they had been compared (the one set directly, the other indirectly) with Kew standards.

Three perfectly independent sets of observations were made with the water in the state in which it was collected; but as Mr. Buchanan, of H.M.S. *Challenger*, has found that the specific gravities of different sea-waters lie between the extreme values 1·0278 and 1·0240, and since, in order to be of value in the investigation of the physical condition of the ocean, the observations on their value and the formulæ of reduction ought to be correct to the fourth decimal place, quantities of the sea-water were diluted with distilled water, so as to have specimens of approximately the specific gravities of 1·020 and 1·025; and a third quantity was concentrated by evaporation until its specific gravity was increased to 1·033; two series of independent observations were made on the expansion of each solution.

Empirical formulæ were calculated to express the results of

each series of observations; and in the original paper full details of the observations are given, together with tables, showing the agreement between the calculated and observed results, and also (after the necessary corrections and reductions have been made) between the volumes calculated from the formulæ from different series of observations in the same solutions.

Finally, a general formula of the form

$$v = \phi(t) + \psi(t) f(s)$$

was found, giving the relation between the volume (v), temperature (t), and specific gravity at 0° C. (s) of any solution of the same composition of sea-water the specific gravity of which at 0° C. lies between 1·020 and 1·033, the volume at the same temperature being taken as unity; in which expression

$\phi(t) = 1 + \cdot00008097t + \cdot0000049036t^2 - \cdot000000012289t^3$,

$\psi(t) = -10^{-5}(\cdot5509t - \cdot020198t^2 - \cdot00033276t^3)$,

and

$f(s) = 11\cdot95 - 940(s - 1\cdot02)$.

In the original paper it is shown that if σ be the specific gravity at any temperature t and of a solution the specific gravity of which at 0° C. is s, $\frac{d\sigma}{ds}$ may without sensible error be assumed to be constant; whence, by means of the above formula, the authors are able to give in a table all the data necessary for calculating the specific gravity of sea-water of any degree of salinity at any temperature between 0° and 36°.

The authors conclude by discussing the discrepancies which occur between their results and those of Prof. Hubbard; and they point out various circumstances in the methods employed in making and reducing the latter observations which appear to them to explain in a great measure the divergences which exist.

On the Action of Light on Tellurium and Selenium. By Prof. W. G. Adams, F.R.S.

A small bar of tellurium, an inch long, whose resistance was half an ohm, forming part of one of the resistances in a Wheatstone's Bridge, was exposed to the light of a paraffin lamp at a distance of half a metre from it. At first, on exposure, the heat from the lamp increased the resistance of the tellurium.

When a rectangular vessel of water was placed between the lamp and the tellurium there was found, on exposing as before, to be no perceptible change in the resistance. On removing the rectangular vessel and putting a cylindrical beaker of water in its place, so as to focus the light on the tellurium, the resistance of the tellurium was found to be diminished.

When it had been kept in the dark for several days the tellurium was much more sensitive to light. When exposed to the paraffin lamp the resistance of the tellurium was now found to be as much *diminished* without using the beaker of water as it had previously been when the beaker was used. On introducing the beaker of water between the tellurium and the lamp, the resistance of the tellurium was still further diminished, the change produced in the resistance by the exposure being $\frac{1}{300}$th part of the whole.

When the selenium bar was exposed to the same lamp at the distance of 1 metre, the change in the resistance was $\frac{1}{6}$th of the whole.

On exposing the selenium to a constant source of light at different distances, the change in the resistance of the selenium is *inversely as the distance*, *i.e.*, directly as the square root of the illuminating power.

The following results were obtained with one candle and an argand lamp, whose illuminating power is equal to sixteen candles:—

	At $\frac{1}{4}$ metre.	At $\frac{1}{2}$ metre.	At 1 metre.	At 2 metres.
With argand lamp	—	170	83	39
With 1 candle	—	41	18	8
With 1 candle	82	39	18	8

These and other similar experiments clearly show that the change in the resistance of the selenium is *directly* as *the square root* of the illuminating power.

Mathematical Society, Jan. 13.—Lord Rayleigh, F.R.S., vice-president, in the chair.—Major J. R. Campbell, Mr. R. F. Scott, and Prof. H. W. Lloyd Tanner were admitted into the Society.—The following communications were made:—Mr. J. W. L. Glaisher, F.R.S., on an elliptic-function identity.—Prof. H. W. Lloyd Tanner on the solution of partial differential equations of the second order with any number of variables when there is a complete first integral.—Prof. Clifford, F.R.S., on free motion of a rigid system in an n-fold homoloid; expression of the velocities by Abelian functions.—The following abstract of Prof. Clifford's paper will give some idea of the mode of treatment employed:—Equations corresponding to Euler's are obtained for the $\frac{1}{2}n(n-1)$ rotations p_{hk}; these are $\lambda_{hk} d_t p_{hk} = \Sigma p_{hl} p_{kl}$ where the λ are expressed in terms of the n constants α, namely, $\lambda_{hk}(\alpha_h - \alpha_k) = \alpha_h + \alpha_k$; it is understood that $p_{hk} = -p_{kh}$. It is then shown that similar equations are satisfied by quotients of θ-functions of $n-2$ arguments, one argument being $at + \epsilon$. The solution of the problem for the rotational velocities in n variables carries with it the determination of the position in the case of $n-1$ variables; the co-ordinates of the principal points are thus expressed in terms of the combinations of θ-functions which Rosenhain used for the inversion of integrals of the third class.—Lord Rayleigh, F.R.S., on the approximate solution of certain potential problems.

Royal Astronomical Society, Jan. 14.—Prof. Adams, president, in the chair.—A paper by the Astronomer Royal was read on the present state of his calculations for his new lunar theory.—Capt. Orde Browne read a paper on the times of the phenomena of the Transit of Venus. He compared the times given by the observers at the different Egyptian stations, and showed that the observations might be divided into three classes, in the first of which it seemed probable that the observers had noted as the time of internal contact the moment at which a *shadowy* ligament was first formed between the limbs of the planet and the sun. In the second class it appeared that the observers had noted as the time of internal contact the moment at which a *black* ligament, as dark or nearly as dark as the planet's disc, was first seen between the limbs of the planet and the sun; observers of the third class had waited for what he termed geometrical contact, or the moment when the discs of the planet and the sun appeared to have a common tangent. Mr. Burton said that the chief difficulty which he had experienced in noting the exact moment of internal contact at ingress arose from the bright line which was seen surrounding the dark limb of the planet before it entered upon the sun's disc, this prevented him from determining the moment when the solar cusps actually met around the disc of the planet.—Mr. Christie described a new form of solar eye-piece which he had devised. It consisted of a series of glass prisms placed between the eye-piece and the eye of the observer in such a manner that the light was reflected nearly at the polarising angle, and when the prisms were turned round relatively to one another, the intensity of the ray entering the eye could be adjusted with great nicety. The chief advantages of this plan were that by placing the prisms between the eye-piece and the eye the reflecting surfaces could be kept small and the eye-piece could be used as a photometer for comparing the intensity of very bright lights, as it was evident that the intensity of the reflected and emergent rays could be easily calculated directly the positions of the prisms were known.

Geological Society, Jan. 5.—Mr. John Evans, F.R.S., president, in the chair.—John Kenworthy Blakey, Frederick Hovenden, and Thomas Lovell, M. Inst. C.E., were elected Fellows of the Society.—The following communications were read:—Historical and personal evidences of subsidence beneath the sea, mainly if not entirely in the fourteenth and fifteenth centuries, of several tracts of land which formerly constituted parts of the Isle of Jersey, by Mr. R. A. Peacock, C.E.—In this paper the author brings forward a great number of details, derived in part from personal observations and in part from ancient documents, to prove that a considerable submergence of land has taken place round the island of Jersey within comparatively recent times. He referred principally to the existence of a submerged forest in the Bay of St. Ouen, evidenced by the existence of stumps of trees in the sea-bottom there, and by the traditional fact that up to quite a late period fees were paid for privileges connected with the forest of St. Ouen, although the forest itself had long previously disappeared beneath the sea. From the evidence it would appear that the submergence took place at the end of the fourteenth or the beginning of the fifteenth century. The author also noticed the occurrence of peat and submarine trees in the little bay of Grève de Lecq on the north side of Jersey, and especially referred to the evidence afforded by the Ecrehous rocks and Maitre Isle, there having been in the latter a priory or chapel, supported by rents derived from the parish of Ecrehous, which is now represented only by a small islet, with the ruins of an ecclesiastical building upon it, and a range of rocks protruding but little above the sea.—The physical conditions under which the Upper Silurian and succeeding Palæozoic Rocks were probably

deposited over the Northern Hemisphere, by Mr. Henry Hicks. In this paper the author, after pointing out the lines of depression explained in his former paper to the Society, now further elaborated the views then propounded by him by carrying his examination into the higher Palæozoic series and into more extensive areas. Beginning at the top of the Lower Silurian, where he first recognises any evidence of a break in the Palæozoic rocks, he proceeded to show that this break was restricted to very limited areas, and almost entirely confined to the parts which had been first submerged, and where the greatest thickness of sediment had accumulated on both sides of the Atlantic, and hence where the pre-Cambrian crust had become thinnest. On the European side this break occurred where volcanic action had taken place, and has doubtless to be attributed to the combined action of upheaval of portions of the crust and the heaping up of volcanic material, the latter in some cases forming volcanic islets of considerable extent. He strongly objected to look upon these breaks, even in the British area, where they are most marked, as evidence of a want of continuity over other and far greater areas; or to admit that even where there was conformity in the rocks at this point, "great intervals of time are indicated, unrepresented by stratified formations." The conformity found in extensive and widely separated areas is proof also that a gradual contraction took place of an enormous portion of the crust in the northern hemisphere in Palæozoic times; and the breaks at the close of the Lower Silurian and in the Devonian are not indications of an arrest in the general subsidence. After indicating the changes which must have taken place in the climate from this gradual spreading of the water and the evidence to be derived from the consideration of the deposits and the faunas, the author drew the following general conclusions:—1. That the condition of the northern hemisphere at the beginning of Palæozoic time was that of immense continents in the higher latitudes, traversed by mountainous ranges of great height, but with a general inclination of the surface, on the one side (European) to the south-west and south, and on the other side (American) to the south-east and south. 2. That these continents were probably covered, at least in their higher parts, with ice and snow; and that much loose material had consequently accumulated over the plains and deeper parts, ready to be denuded off as each part became submerged. This would account for the enormous thickness of conglomerates, with boulders, grits, and sandstones, found in the early Cambrian rocks, and also to a certain extent for their barrenness in organic remains. 3. That the depression over the European and American areas was general from at least the latitude of 30° northwards; that the parts bordering the Atlantic were the first to become submerged; the lower latitudes, also, before the higher. 4. That the depression could not have been less altogether, for the whole of the Palæozoic, than 50,000 feet; and that conformable sediments to that extent are found over those parts of the areas first submerged, and which remained undisturbed. That volcanic action was chiefly confined to parts of the regions which became first submerged; that the immediate cause of these outbursts was the weakness of the pre-Cambrian crust at those parts, from the great depression that had taken place, it being too thin there to resist the pressure from within, and to bear the weight of the superincumbent mass of soft sediment. 5. That the seat of volcanic action at this time was at a depth of probably not less than twenty-five miles, as sediments which were depressed to a depth of from nine to ten miles do not indicate that they had been subjected to the effect of any great amount of heat, and are free from metamorphosis. 6. That the climate at the early part of Palæozoic time was one of very considerable, if not extreme cold, and that it became gradually milder after each period of depression. That towards the close of the Palæozoic, in consequence of the elevation of very large areas, and to a great height, the climate became again more rigorous in character. 7. That the various changes which took place over the northern latitudes during Laurentian and Palæozoic times allowed marine and land life to develop and progress in those areas at interrupted periods only; consequently most of the progressive changes in the life had to take place in more equatorial areas, where the sea-bottom was less disturbed, and where the temperature was more equable. Any imperfection, therefore, in the Palæontological record belonging to these early times should be attributed to these and like circumstances; for wherever an approach to a complete record of any part of the chain is preserved to us, the evidence points unmistakably to an order of development, through a process of evolution from lower to higher grades of life.

Anthropological Institute, Jan. 11.—Mr. A. W. Franks, F.R.S., vice-president, in the chair.—Messrs. H. A. Husband, E. Croggan, J. B. Lyons, and W. R. Cornish were elected members.—Mr. W. S. W. Vaux, F.R.S., read a paper on the Maori race of New Zealand. There were three sources from which some information as to the origin of the Maoris might be gained. Firstly, from traditions, among which a very general and remarkable uniformity prevails, pointing to the conclusion that the ancestors of the Maoris came from the north and north-east in small numbers and a few at a time, the names of some of the canoes in which they arrived having been preserved. The author thought that the evidence in favour of those traditions was conclusive. Secondly, from their ethnology and customs. With regard to the former, appearances were at first sight in favour of a mixed origin, the diversities in physiognomy and colour being considerable; but to that view the author thought the linguistic evidence furnished an unanswerable objection. As to the customs of the Maoris, they did not differ much from those found in other groups of Polynesian Islands, indicating a former intimate connection between them all. Thirdly, from language. The general conclusion of the author from that argument was that there was one Polynesian language which had been broken up into many dialects, the Maori being one. That opened out the larger question as to who the Polynesians were, and it was in that direction that inquirers must search for the origin of the Maoris. Evidence finally pointed to Asia for the solution of the problem.—Dr. Hector, F.R.S., exhibited and described at length the collection of stone and other implements he had recently brought from New Zealand, and went minutely into the circumstances of their discovery, their varieties, and uses. He also entered into a discussion on the traditions of the Maoris, their population in the two islands, their manners and customs, their language and physique, drew a comparison between them and the Moriories, and treated of many other topics relating to the past history and present condition of the people.

Physical Society, Jan. 15.—Prof. Gladstone, F.R.S., president, in the chair.—The following candidates were elected members of the society:—Sir David Lionel Salomons, Bart., Arthur R. Granville, and Capt. Abney, R.E.—Prof. Woodward, of the Midland Institute, Birmingham, exhibited and described a novel form of apparatus for showing either the longitudinal motion of sound-waves or the transverse vibrations of those of light. It consists essentially of a series of balls suspended in a horizontal line by strings. These balls rest against a series of transverse equidistant partitions in a wedge-shaped horizontal trough, which can be raised and depressed parallel to itself. If, while a ball is placed against each partition, the frame be drawn aside in the plane in which the balls hang, and then slowly depressed horizontally, the balls will be successively liberated, the order in which this takes place being regulated by the heights of the partitions. As these gradually increase from one end to the other, the appearance presented is that of a series of condensations and rarefactions, as in the ordinary acoustic wave. If the frame be drawn aside parallel to itself prior to depressing it, the balls will rest against one side of the trough and can be liberated in succession, causing them to oscillate in planes parallel to themselves. By this means a vibration of the particles is set up resembling that of polarised light.—Prof. Guthrie suggested that Mr. Woodward should devise a similar apparatus for exhibiting stationary waves.—Prof. Woodward said he would remember the suggestion, and stated that he had endeavoured to adapt the apparatus to circular and elliptic wave-motion, but experienced considerable difficulty.—Mr. Lockyer then made a communication on some recent methods of spectroscopy. At the outset he mentioned that he brought these processes forward in the hope that others present might be induced to take up some branch of the work. The first subject of which he treated was the photographing of the solar and metallic spectra. Mr. Rutherford, of New York, who has produced some of the finest photographs of spectra extant, has shown that to obtain clear photographs the smallest possible portion of the surface of the prism should be employed. An excellent method for ensuring this is to bring the light on the slit by means of a common opera-glass (as large as possible), which should reduce the beam of parallel rays incident on the prism to not more than a quarter of an inch in diameter. Mr. Lockyer exhibited the four-prism spectroscope employed by himself, to which a camera about four feet long is adapted. By this apparatus a large series of comparisons has been obtained between the sun and metals, the slit employed being provided with five slides, so that the spectra can be

accurately arranged side by side. It is advisable always to observe the image of the electric arc when comparing the spectra of metals with that of the sun, rather than direct light. It is also found very advantageous to place the poles of the lamp at right angles to the slit, as by this means the long and short lines in the spectra are more sharply defined than when observed in the ordinary manner. In the photograph comparing the spectra of aluminium and calcium it is noticeable that certain lines are common to the two, but those which are thick in the aluminium spectrum are thin in that of calcium, and *vice versâ*. This depends on the quantities of impurity present. It has thus been shown that there are no proper coincident lines in the spectra of any two simple substances, and that there is no substance spectroscopically pure. The relation between the lengths of the lines and the amounts of metals employed to produce the spectrum convinced Mr. Lockyer that it would be possible to employ the spectroscope for quantitative analysis. The earlier experiments in this direction were then referred to, as well as those on which Mr. Lockyer has recently been engaged in conjunction with Mr. W. Chandler Roberts, of the Royal Mint, with a view to ascertain how far it is possible to detect small differences of composition in gold-copper alloys such as that used for the coinage. The method employed was then described. It consists in measuring, by means of a micrometer in the eye-piece of a four-prism spectroscope, the relative lengths of certain gold and copper lines when the image of an induction coil spark passing from the alloy under examination is focussed on the slit. Although the results obtained have not been uniformly comparable, and therefore reliable, it is nevertheless certain that a difference of composition as minute as the $\frac{1}{10000}$th part is recognisable by this means. Another method of spectroscopic research which Mr. Lockyer next described was the study of the absorption spectra of metals when they are not subjected to so violent an action as that of the electric arc. Observations of this nature have been made at low temperatures by Roscoe and Schuster, and by Mr. Lockyer, and at the highest temperatures produced by the oxyhydrogen blow-pipe by the latter in conjunction with Mr. Roberts. These experiments, which have been fully described in the Proceedings of the Royal Society, show that the absorption spectra of metals may be divided into five classes, which, for any particular metals, depend on the amount of heat applied. They suggest that in passing from the liquid to the most perfect gaseous state, vapours are composed of molecules of different orders of complexity; and that this complexity is diminished by the dissociating action of heat, each molecular simplification being marked by a distinctive spectrum.—The President inquired whether the iridium line to which Mr. Lockyer had referred, and by means of which the metal was originally discovered, was absolutely identical with a hydrogen line.—Prof. McLeod asked if Mr. Lockyer had found that the incandescence of the air made any difference in the character of the spectra, and drew attention to the advantage of a small lens placed in front of the slit.—Mr. Woodward inquired whether any mechanical means were adopted for ensuring that the lamp gave a constant light while in the horizontal position.—Dr. Guthrie referred to the spectrum observed when light traverses the vapours resulting from the action of copper on nitric acid. He wished to know whether the number of bands observed stands in any relation to the number of possible oxides of nitrogen at a given temperature; or must one oxide of nitrogen be considered as being capable at that temperature of giving bright and dark bands according to the way in which the light acts on it?—Mr. Lockyer, in reply to the president's question, said that, so far, no difference has been observed between the refrangibility of the hydrogen line and that of iridium. He is anxious to ascertain whether any occluded hydrogen exists in the metal. Little or nothing is known as to the subject referred to in Dr. Guthrie's question. The use of the electric lamp eliminates all difficulty with reference to air lines, as its "atom-shaking" power is not sufficient to break up to the line stage the molecules of nitrogen and oxygen. It was found necessary to make the adjustments referred to by Mr. Woodward entirely by hand.

Victoria (Philosophical) Institute, Jan. 17.—On the Scientific Conclusions and Theological Inferences, in a recent work entitled "The Unseen Universe," was read by the Rev. Prebendary Irons, D.D., the Bampton Lecturer for 1870.

PARIS

Academy of Sciences, Jan. 10.—Vice-Admiral Paris in the chair.—The following papers were read:—Experimental critique on the formation of saccharine matter in animals, by M. Cl. Bernard; an *aperçu* of his researches on the subject.—Researches on aldehyde, by M. Berthelot. He measures the heat liberated in transformation of aldehyde into acetic acid, and into oxalic acid, the heat of vaporisation, &c.—Union of carburets of hydrogen with hydracids and halogenic substances, by M. Berthelot.—Micrometric measurements taken during the transit of Venus, by M. Mouchez.—On the causes of failure in searching for minimal quantities of iodine, by M. Chatin.—New considerations on the regulation of slide valves, by M. Ledieu.—M. Mouchez presented some new maps of the coast of Africa.—Report on the project of a physical observatory on the top of the Pic du Midi de Bigorre, submitted to the Academy by General de Nansouty, in name of the Société Ramond. This peak (in the Pyrenees) is 2,877 metres in height, and only 527 short of the highest. It is somewhat isolated, and receives the direct shock of the great Atlantic air-currents; and it is easily accessible. A small hotel on the Col de Sencours (511 m. lower) has been provisionally used for observations since 1873, but amid great difficulty, from avalanches, &c.—Report on a memoir entitled "Problème inverse des brachistochrones," by M. Haton de la Goupillière.—Influence of tempering on magnetisation, by M. Gaugain. The bars hardened most are those which take the greatest magnetism, when one uses the most powerful means of magnetisation; but annealed bars are magnetised most powerfully where less energetic means are employed.—On the recent falling in on Bourbon Island, by M. Velain. The disaster was due to disaggregation of certain volcanic rocks under atmospheric agencies.—On a subterranean commotion in the centre of the isle of Réunion; disappearance of a hamlet of sixty-two persons, by M. Vinson.—On a pocket telemeter with double reflection, by M. Gaumet.—On the winter egg of Phylloxera, by M. Boiteau.—M. Carvalho presented a model of an ozonogenic apparatus, for rendering apartments wholesome in hot and unhealthy climates. It is a kind of condenser of the electric effluve. M. Thénard gave a warning on the poisonous action of ozone.—Generalisation of the theory of an osculating radius of a surface, by M. Lipschitz.—Note on a particular class of left decagons, inscriptible by an ellipsoid, by M. Serret.—Note on the application of recurrent series to investigation of the law of distribution of primary numbers, by M. Lucas.—On the spectrum of gallium, by M. Lecoq de Boisbaudran. With chloride of gallium he gets two narrow lines, α 417·0 and β 403·1.—On the decrease of sugar in beets during the second period of their vegetation, by M. Cosenwinder.—On the installation of the Meteorological Observatory of the Puy de Dôme, by M. Alluard. Observations (every three hours) were commenced on Dec. 20, 1875. A station on the plain, at Clermont, 9 kil. distant, and 1,100 m. under the summit, is supplied with the same instruments, and the two stations are connected telegraphically.—On the periodic movements of leaves in *Abies nordmanniana*, by M. Chatin.

CONTENTS